

Glacier Retreat, Lakes Development and Associated Natural Hazards in Cordillera Blanca, Peru

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Chapter

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Abstract

Cordillera Blanca is the heaviest glacierized tropical range in the world. Due to the global climate change, most of glaciers are retreating and thinning. Glacier retreat leads to the formation and development of all types of potentially hazardous glacial lakes (bedrock-dammed, moraine-dammed, and ice-dammed). Potential hazardousness of glacial lakes is strongly interconnected with dynamic slope movements: (1) sudden release of water from glacial lakes (also known as glacial lake outburst floods—GLOF) is mainly caused by dynamic slope movement into the lake (about 80 % in the Cordillera Blanca);

(2) released water may easily transform into debris-flow or mud-flow, thanks to its high erosion and transport potential. Based on field study and remotely sensed images, this contribution documents glacier retreat in the Cordillera Blanca with regards to formation and development of new potentially hazardous glacial lakes, which evolve mainly in elevations of about 4,600–5,000 m a.s.l. We introduce and describe three hazardous events associated with glacier retreat in the last decade: (a) sudden release of water from moraine-dammed Lake Palcacocha in 2003; (b) sudden release of water from bedrock-dammed lake No. 513 in 2010; and (c) sudden release of water from bedrock-dammed Lake Artizon Alto and subsequent moraine dam failure of downstream situated Lake Artizon Bajo in 2012. The first and third events were caused by landslides of lateral moraines (which are often non-consolidated and nearly vertical) into the lakes. The second event was caused by ice- and rockfall into the lake. These events illustrate that various natural hazards (dynamic slope movements, floods) associated with glacier retreat in the Cordillera Blanca are closely linked and represent actual threats to urbanization and safety of lives and property.